

Presentation to:

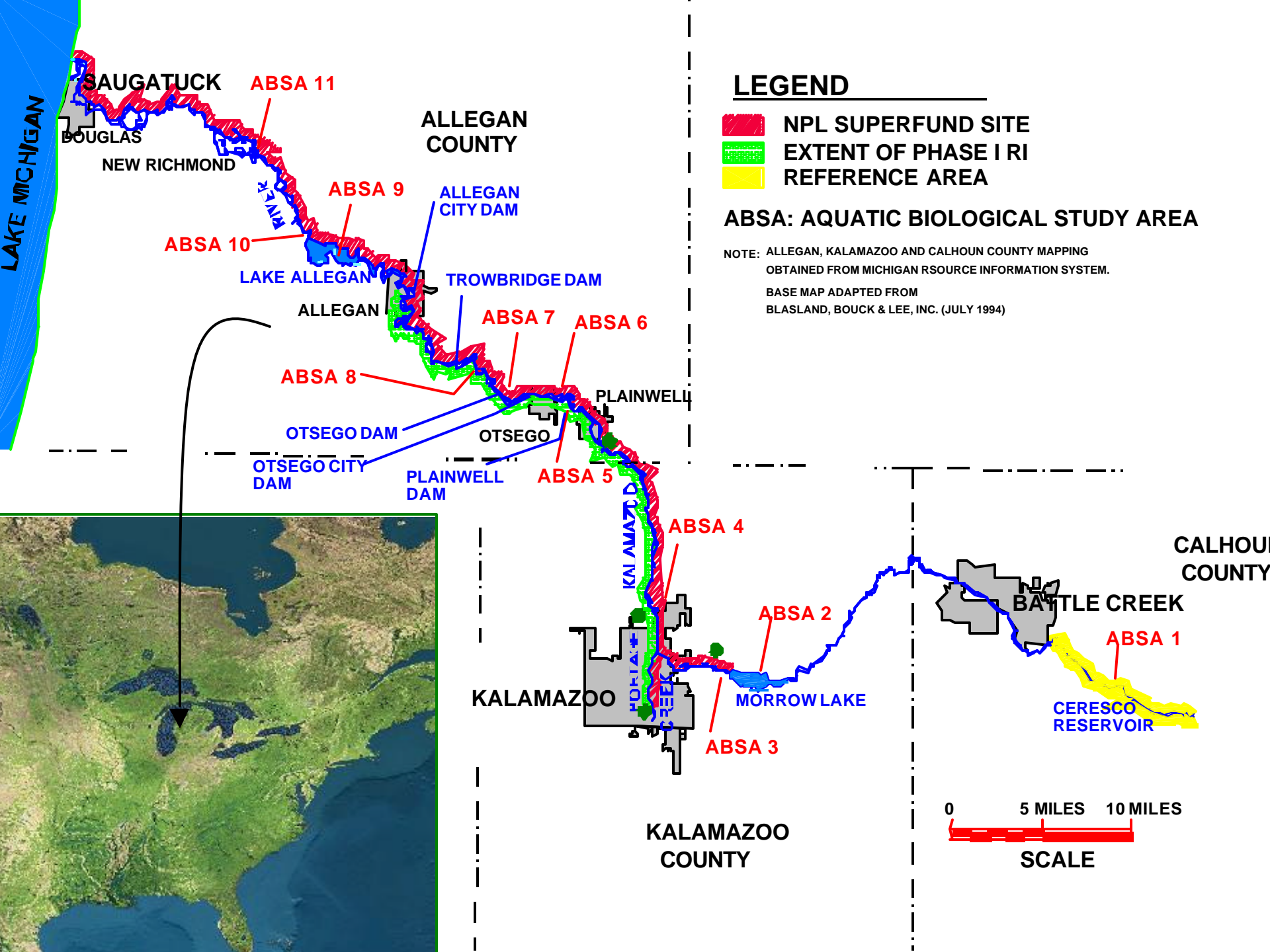
Contaminated Sediments Technical Advisory Group (CSTAG)

Comments to the Contaminated Sediment Technical Advisory
Group on the Allied Paper, Inc./Portage Creek/Kalamazoo
River Superfund Site

April 16, 2002

Claudia Kerbawy, MDEQ
Keith Krawczyk, MDEQ





Impoundments on the Kalamazoo River

Impoundments lowered in the 70's prior to knowledge of PCB Problem

State-owned Dams

Plainwell Dam



Otsego Dam



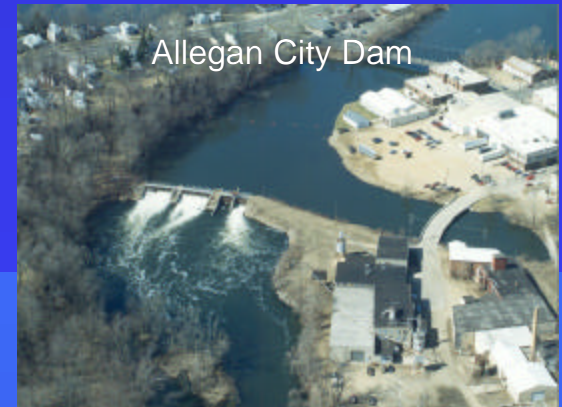
Trowbridge Dam



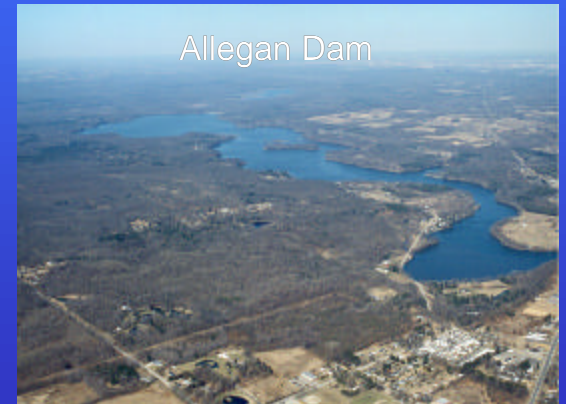
Otsego City Dam



Allegan City Dam

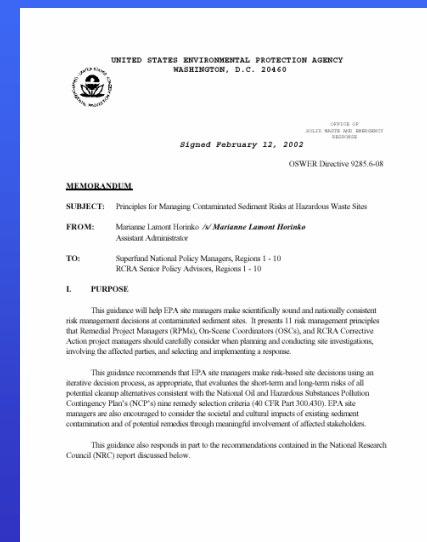


Allegan Dam



Presentation Objectives

- Share with you our concerns and goals for the Kalamazoo River Site
- Demonstrate how these goals conform with key principals identified in USEPA (OWSER Directive 9285.6-08) "Managing Contaminated Sediment Risks at Hazardous Waste Sites"



MDEQ Goals for the Site

- Want realistic goals that can be achieved
- Action coordinated with “not delayed by study”
- Public acceptance of remedial actions
- Want long term solutions for the site
- Restore wetland and riparian habitats
- Remove fish advisories
- Protect the ecological community along the river

Principal 1- Control Sources Early

- Early focus on key source areas
- Interim remedial measures conducted at six major land-based source areas to control PCB release to Portage Creek and the Kalamazoo River
 - King Highway Landfill
 - Former Five Lagoons
 - King Street Storm Sewer/King Mill
 - A-Site
 - Willow Blvd- moving forward toward remedy selection and remaining Allied Paper property
 - Bryant Mill Pond/Portage Creek/Allied Paper
 - Remedy selected 12th Street Landfill
- Secondary sources are major contributor of PCBs to River
 - Re-suspension of contaminated sediments
 - Bank erosion from former impoundments and run of river
 - Uptake of PCBs during inundation from floodplains

Upstream Source Areas that have Undergone Interim Response Action

King Highway Landfill



**Bryant Mill
Pond/Portage Creek**



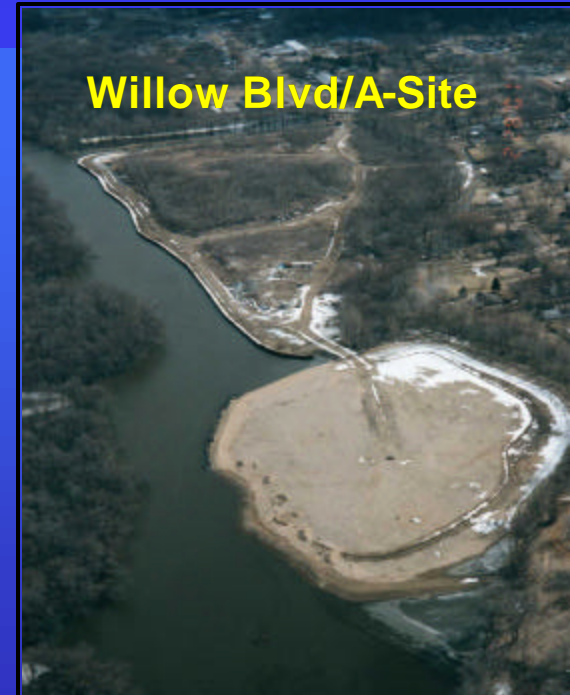
King Street Storm Sewer



GP Former 5 Lagoons



Willow Blvd/A-Site



OU-4 12th Street Landfill

No early control or releases from this land-based Operable Unit, PCBs continue to be released to the river and adjacent wetland community

Plainwell Dam

Wetlands



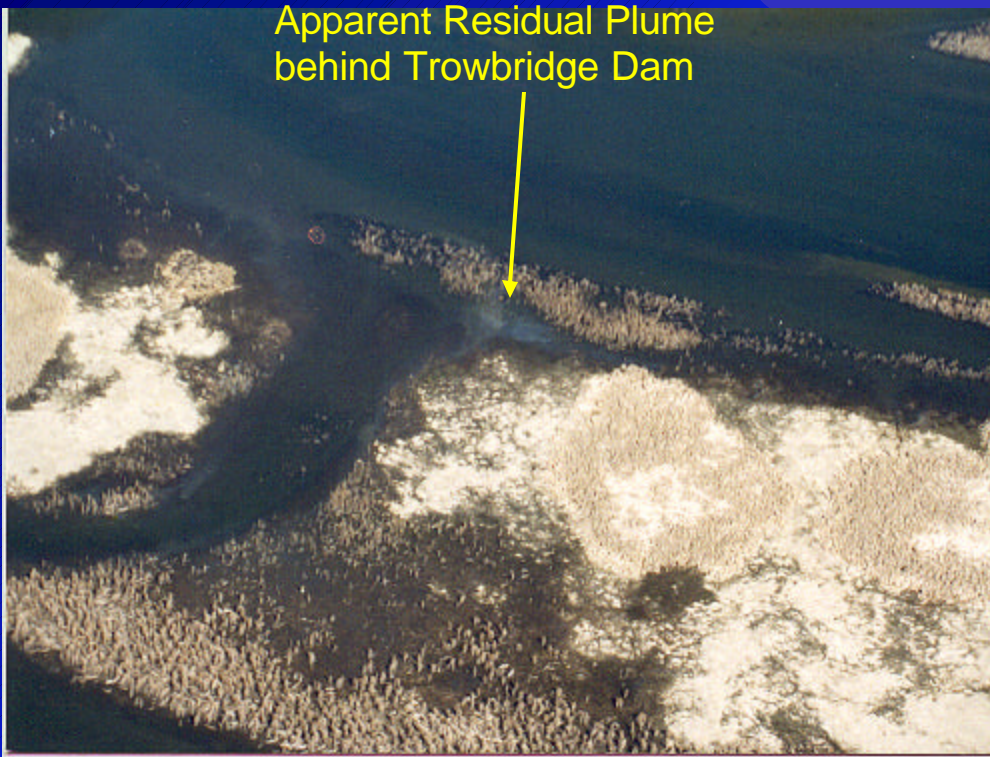
Principal 2- Involve the Community Early and Often

- MDEQ and EPA have been meeting with local officials and the community since the mid 90's
- Encouraged public input on various phases of the RI/FS
- Public highly interested in issues
- Public meetings well attended
- High level of response to Draft PRP RI/FS
 - 592 letters from citizens
 - 23 community groups representing 2,000 local members and 315,000 regional members
 - 17 local units of government
 - Letters from legislators representing 193,000 constituents

Principal 4- Develop and Refine a Conceptual Site Model that Considers Sediment Stability

- Kalamazoo River a shallow flowing river
 - Lake Allegan only waterbody on the river where flow is dramatically reduced
- Sediment stability of former impoundment bank material is different than natural bank material, PCB-contaminated clay paper waste vs. sand
- Extreme events difficult to model, remedial decisions should incorporate more conservatism than model predictions recommend
- Meanders, braided channels and localized events (e.g. fallen trees), prop wash, bioturbation are not accounted for in modeling
- Man-made structures such as existing dams can not be considered permanent containment
- Engineering controls (e.g. rip-rap banks) are counter to trustee goals of returning river to its natural condition

Apparent Residual Plume
behind Trowbridge Dam



PCB contaminated paper waste
along banks of the Kalamazoo River-
Trowbridge Impoundment



Principal 5- Use of Iterative Approach in a Risk-Based Framework

- MDEQ and PRPs generally concur on sediment volume, average PCB concentrations, and surface weighted average PCB concentrations for the site
- Remedial decisions can be applied to large reaches of the river based upon avg. conc., volumes and risks
- EPA pilot study refined previous volume estimates were within 95% confidence limits of RI studies
- Additional sampling can be conducted as part of remedial design
- Unacceptable risks to human, aquatic and terrestrial receptors

Principal 6- Carefully Evaluate the Assumptions and Uncertainties Associated with Site Characterization Data and Site Models

- Uncertainties must be considered in characterization of sediment volumes and concentrations
 - Hot spot removal projections should consider uncertainties and river morphology
 - Realistic assumptions about residual contamination should be incorporated into projections
- Site models are used to determine temporal trends
 - PRPs forecast future PCB concentrations assuming first-order decay will continue

Principal 6- Carefully Evaluate the Assumptions and Uncertainties Associated with Site Characterization Data and Site Models (cont)

- MDEQ not in agreement with PRP first-order decay modeling approach
 - Not based on any mechanistic model
 - Asymptote of these model trends are zero and do not consider if the system can actually achieve a zero concentration
 - Curve fit does not allow for secondary sources/background to influence trend or asymptote
- First-order decay should not be used as a predictive model
- Modified mathematical constructs can be used to allow for:
 - Non-zero asymptotes
 - Multiple model fits based on changes in the data
 - Estimates of uncertainty
- PRPs emphasize trends at Lake Allegan that aren't representative of the site

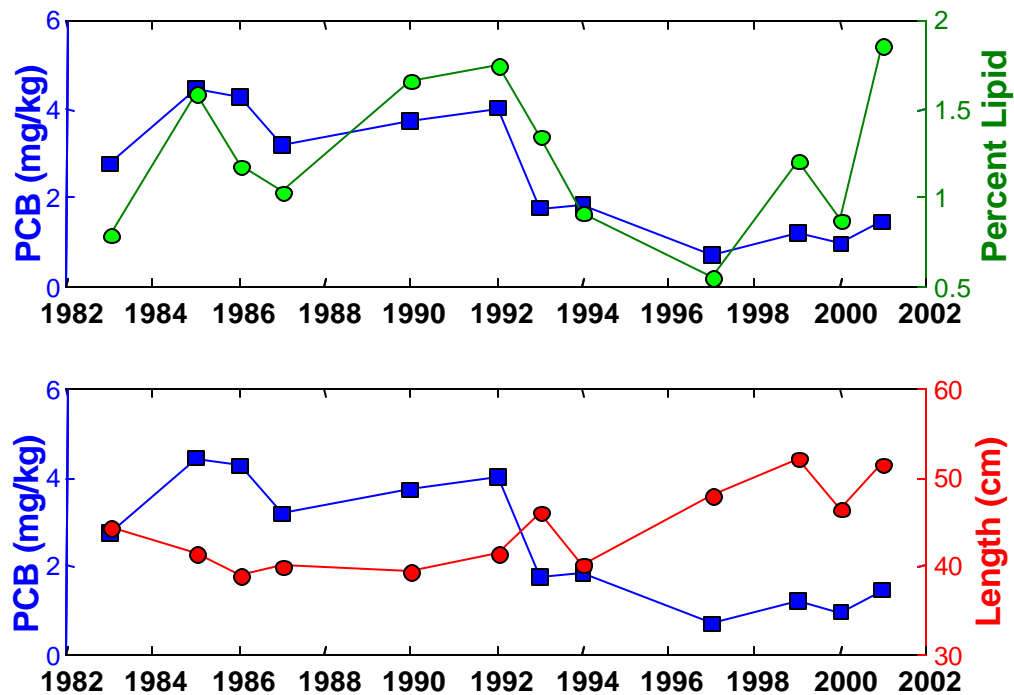
Principal 6- With Respect to Fish Trends

- Assumptions of first-order decay models to describe PCB conc in fish not valid
- In general, fish PCB concentrations are lower than in 1983
 - Improvement due to regulation of PCB discharges
- Since 1990 there are areas of the site that have little or no improvement in PCB fish concentrations
- Further reduction in fish tissue levels may result from additional control of secondary sources
 - However MDEQ/MDNR disagree with PRPs on how this should be done

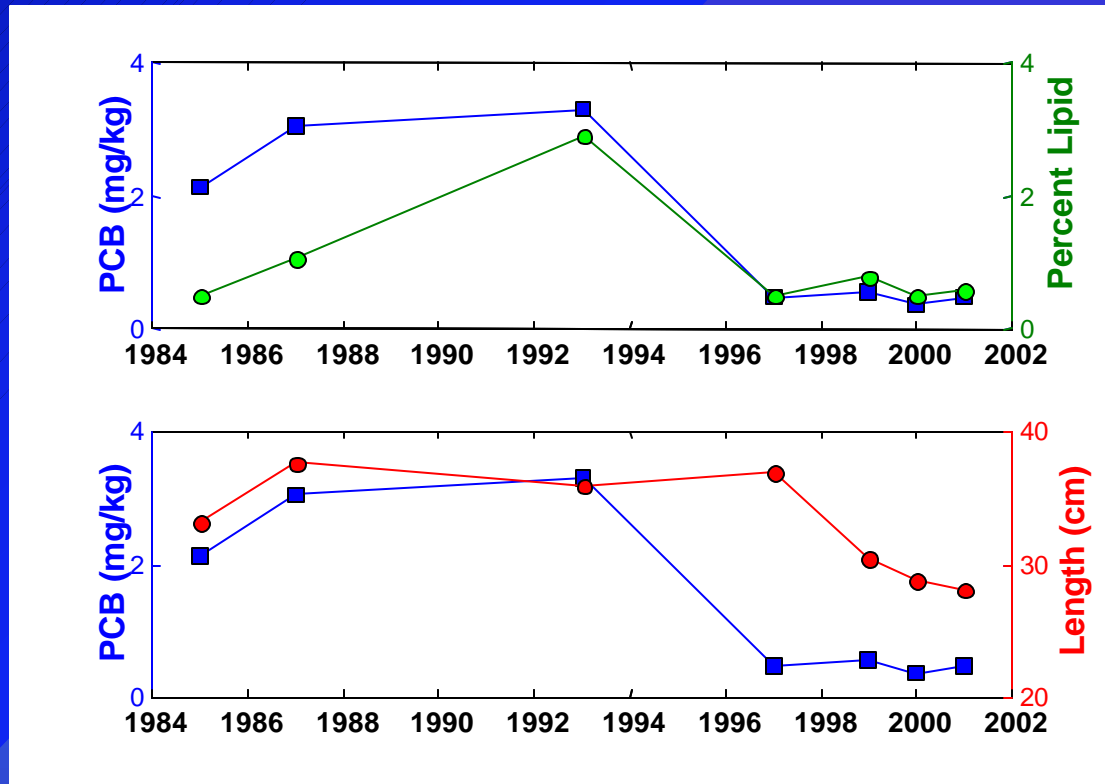
Principal 6- With Respect to Fish Trends

- Fish PCB concentration decay rate is different for each species and river location
- PRPs failed to accurately report uncertainties with decay rate
- MDEQ analysis of data from 1983-2001 showed that at most sites PCB concentrations are not declining or declining slowly

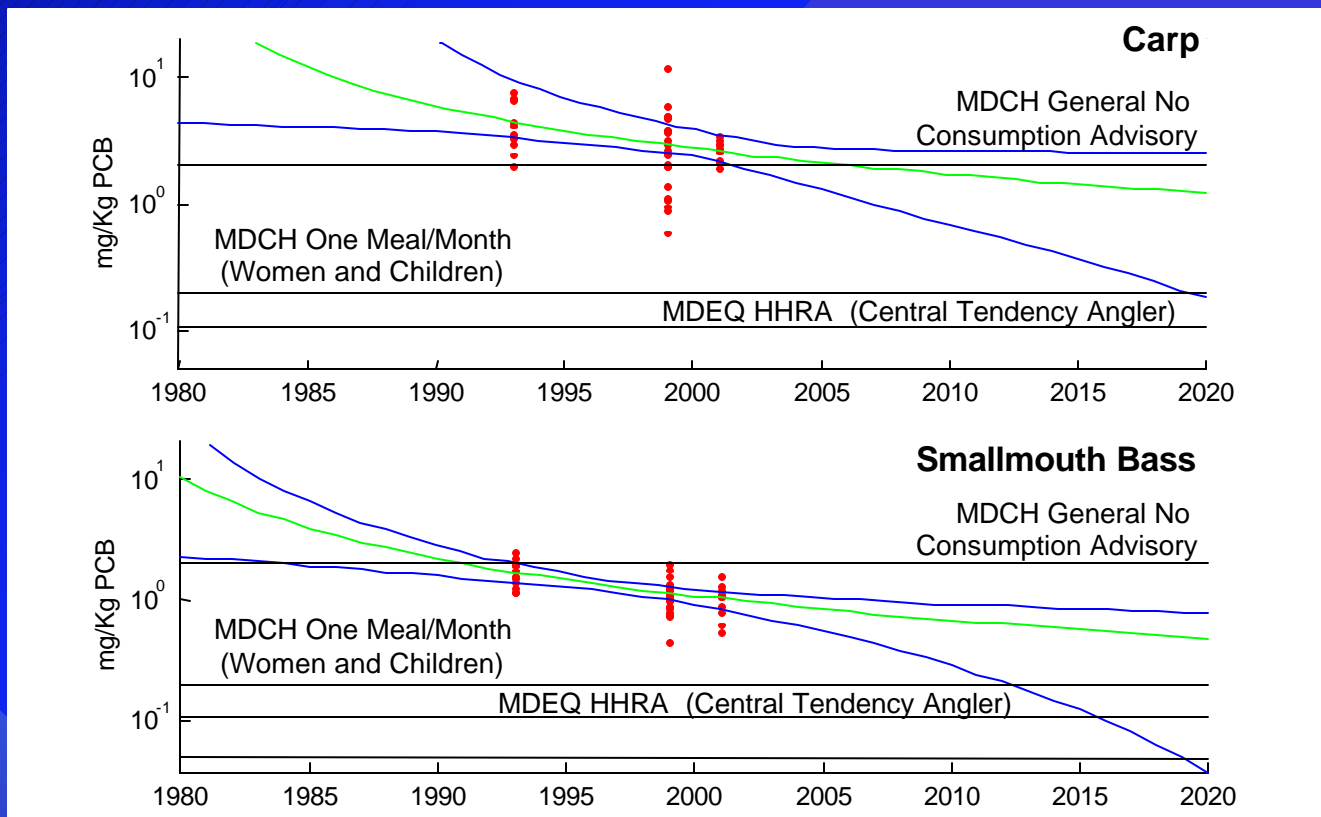
TEMPORAL TRENDS IN AVERAGE LENGTH, LIPID AND WET-WEIGHT PCB IN CARP FILLETS AT LAKE ALLEGAN



TEMPORAL TRENDS IN AVERAGE LENGTH, LIPID AND WET-WEIGHT PCB IN SMALLMOUTH BASS FILLETS AT LAKE ALLEGAN



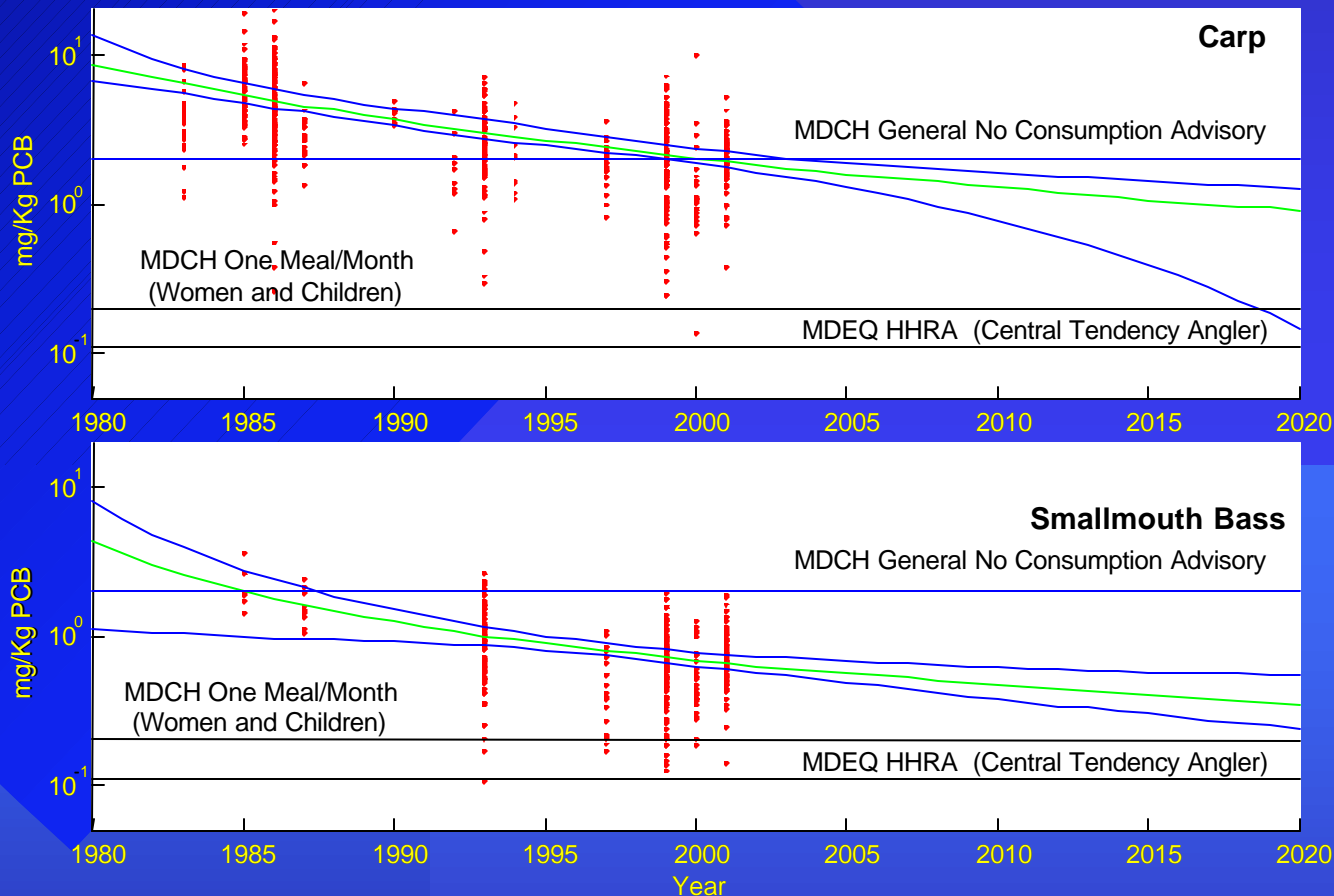
MIXED ORDER TREND MODEL FOR ADJUSTED MEAN PCB CONCENTRATION IN FISH FILLETS FROM TROWBRIDGE IMPOUNDMENT



Notes:

- 1) The modeled mean represents the expected PCB concentration in fish with average length and lipid content, based on
- 2) Smallmouth Bass captured from 1983 through 2001 averaged 33.6 cm in length and on average had 0.88% lipid.
- 3) Carp captured from 1983 through 2001 averaged 51.7 cm in length and on average had 3.34% lipid.
- 4) The mixed order trend model is the solution to the differential equation $dC/dt = -kC^a$ providing a time dependent decay rate.

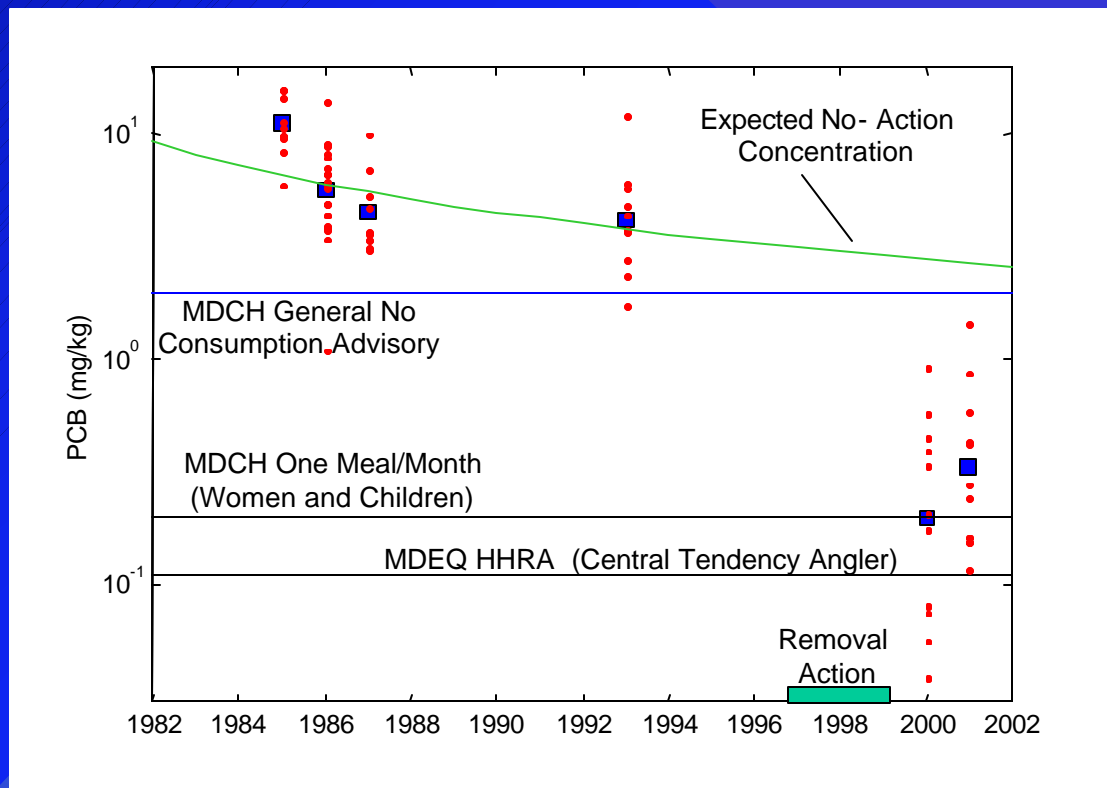
MIXED ORDER TREND MODEL FOR ADJUSTED MEAN PCB CONCENTRATION IN FISH FILLETS FROM MORROW DAM TO LAKE ALLEGAN DAM



Notes:

- 1) The modeled mean represents the expected PCB concentration in fish with average length and lipid content, based
- 2) Smallmouth Bass captured from 1983 through 2001 averaged 33.6 cm in length and on average had 0.88% lipid.
- 3) Carp captured from 1983 through 2001 averaged 51.7 cm in length and on average had 3.34% lipid.
- 4) The mixed order trend model is the solution to the differential equation $dC/dt = -kC^a$ providing a time dependent decay rate.

ADJUSTED PCB CONCENTRATION IN CARP FILLETS AT BRYANT MILL POND BEFORE AND AFTER TIME CRITICAL REMOVAL ACTION IN 1998



Notes:

- 1) The modeled mean represents the expected PCB concentration in fish with length and lipid content similar to that of average fish in the Kalamazoo River and Portage Creek.
- 2) Smallmouth Bass captured from 1983 through 2001 averaged 33.6 cm in length and on average had 0.88% lipid.
- 3) Carp captured from 1983 through 2001 averaged 51.7 cm in length and on average had 3.34% lipid.
- 4) The mixed order trend model is the solution to the differential equation $dC/dt = -kC^n$ providing a time dependent decay rate.

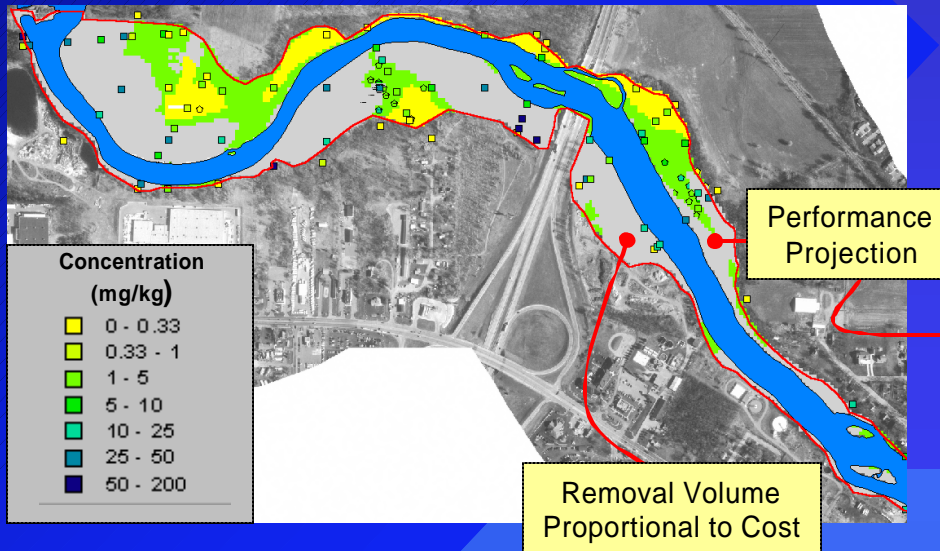
Principal 6- With Respect to Surface Water

- Surface water data is problematic for analysis of time trends because it is:
 - Highly temperature dependent
 - Flow dependent
 - Location dependent
 - Seasonally variable
- No conclusions can be reliably drawn on WQ trends

Principal 6- With Respect to Sediments

- PRPs have described temporal trends in surficial sediments based on selectively sampled sediment cores
 - Trends may not be representative of surficial sediments in general
- Stage 1 EPA data indicate that PCB concentrations in surficial sediment in 1994 and 2001 are similar
- Cores need to come from the same geomorphologic structures to determine temporal trends
- Deposition, scour and meanders are not very predictable outside of impounded and channelized areas

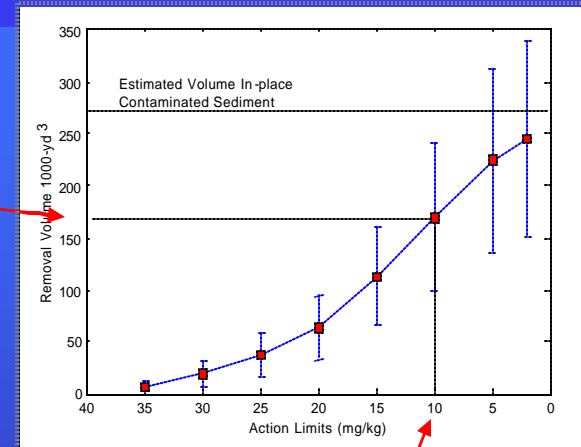
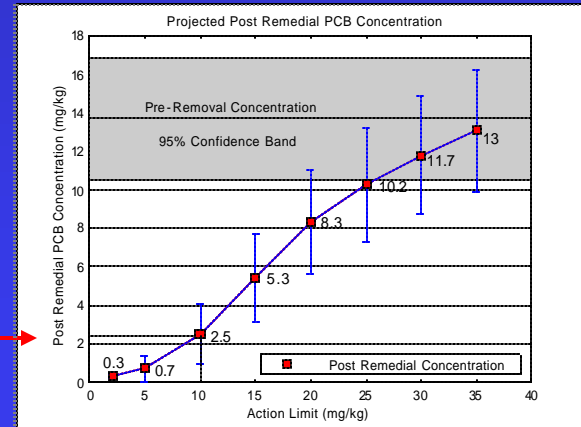
Uncertainty in Cost Effectiveness Estimates at Plainwell Impoundment



Removal area(gray) for arbitrarily selected 10 mg/kg action limit based on the block kriged average.

Nearly all (5178 of a total of 5321) blocks have upper 95% confidence limits above 10 mg/kg.

Post removal surficial PCB concentration is projected to range from approximately 1.0 to 4.0 mg/kg assuming that residual contamination in removal areas is 0.33 mg/kg.



10 mg/kg Action Limit

Principal 6- With Respect to Fate and Transport Models

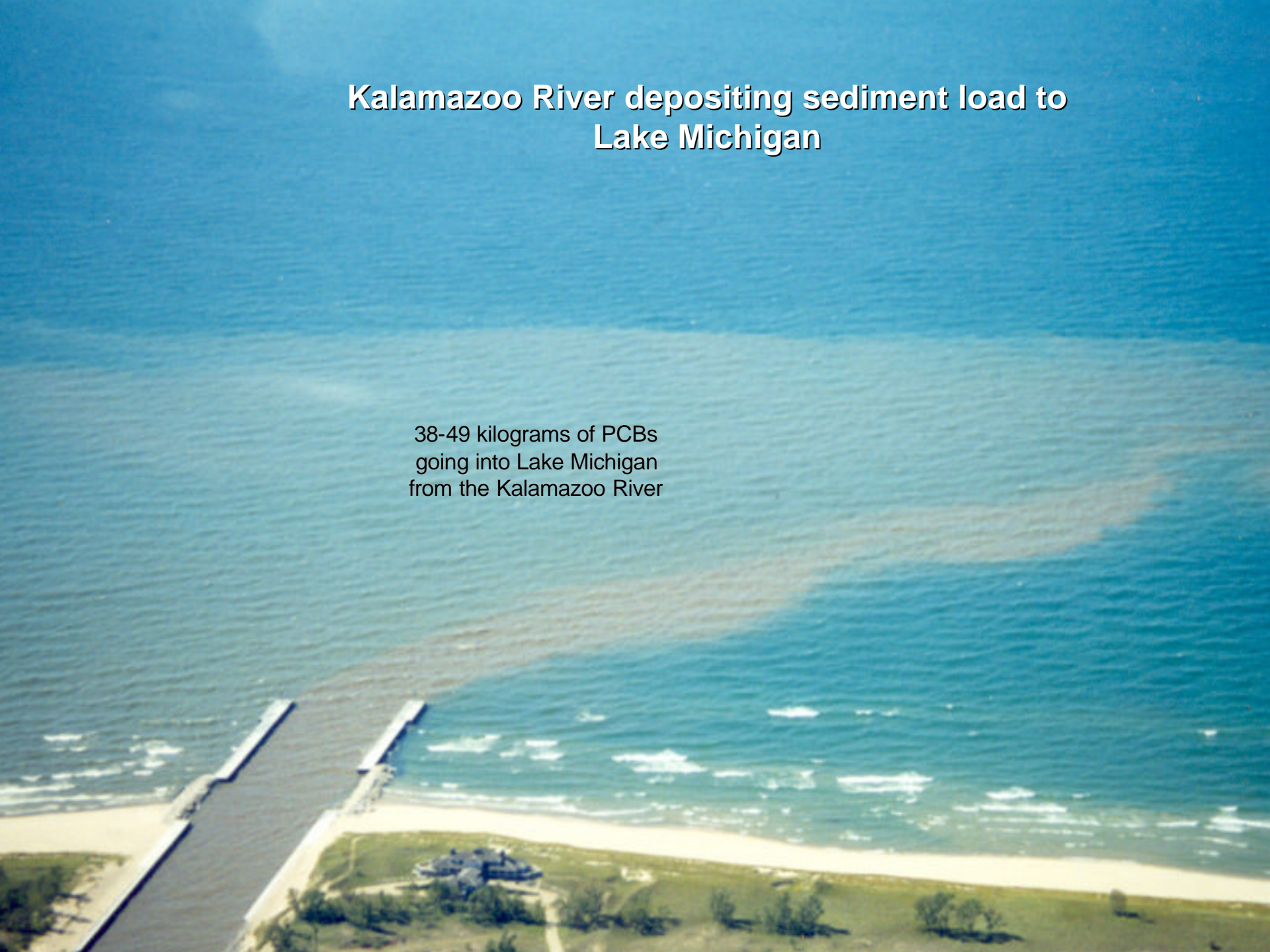
- Fate and transport models must be reflective of actual conditions
- Significant disagreement within the academic community for fate and transport models to evaluate impacts from extreme events
- Localized events such as bioturbation, prop wash, meanders and channel crossings aren't considered in modeling

Principal 6- With Respect to Fate and Transport Models(cont)

- MDEQ modeling contractor (QEA) reviewed PRP fate and transport model for the Site
- QEA determined KALSIM model can not reliably differentiate between PCB loads originating from bank erosion and sediment bed sources
- KALSIM can not evaluate the effects of rare floods
- KALSIM is not realistically predicting natural recovery in the river

Kalamazoo River depositing sediment load to Lake Michigan

38-49 kilograms of PCBs
going into Lake Michigan
from the Kalamazoo River

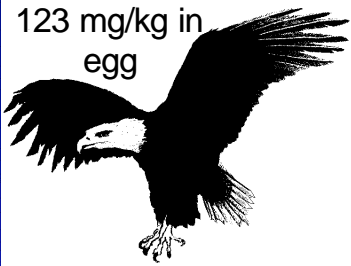


Principal 7- Select Site-Specific, Project-Specific, and Sediment-Specific Risk Management Approaches that will Achieve Risk-Based Goals

- MDEQ has prepared **Baseline** Ecological and Human Health Risk Assessments
- Have been reviewed and accepted by USEPA
 - the site poses unacceptable risks to humans, aquatic and terrestrial receptors
- PRPs believe that the estimated 9 million cubic yards of PCB contaminated media pose no unacceptable risk to ecological and human receptors at the site

Wildlife with Measured PCB Levels (maximum) in Tissue

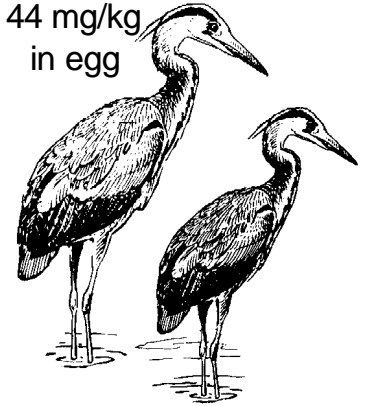
123 mg/kg in egg



8 mg/kg



44 mg/kg in egg



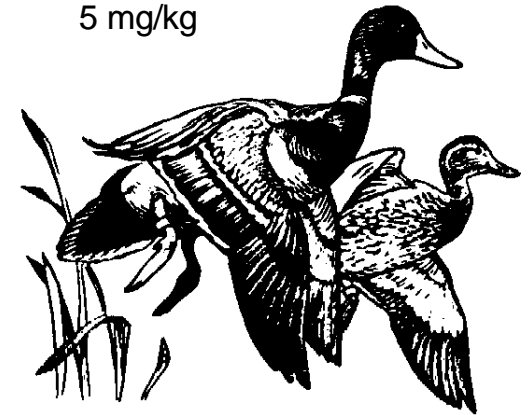
91 mg/kg in egg



3 mg/kg



5 mg/kg



3 mg/kg



52 mg/kg in liver



49 mg/kg in carp



Principal 7- With Respect to the Ecological Risk Assessment

- Sufficient site specific data was collected to determine risks are unacceptable using standard USEPA guidance
- Wide spread of PCB contamination in various trophic levels
- A range of remedial action clean up levels were derived for aquatic and terrestrial receptors for sediment and floodplain sediments, respectively
- Large portions of the site are periodically inundated for 2-4 months during high flows, and therefore aquatic criteria should apply
- Results of MDEQ/CDM SPMD PCB uptake study
 - Greater exposure in seasonally inundated areas
 - These areas represent critical habitat for aquatic species

MDEQ/CDM SPMD PCB RESULTS

Behind Trowbridge Dam

SED= 6-35 ppm

Water= 57 ppt

SPMD= 17 ppm lipid



SED= 0.07-0.005 ppm

Water= 16 ppt

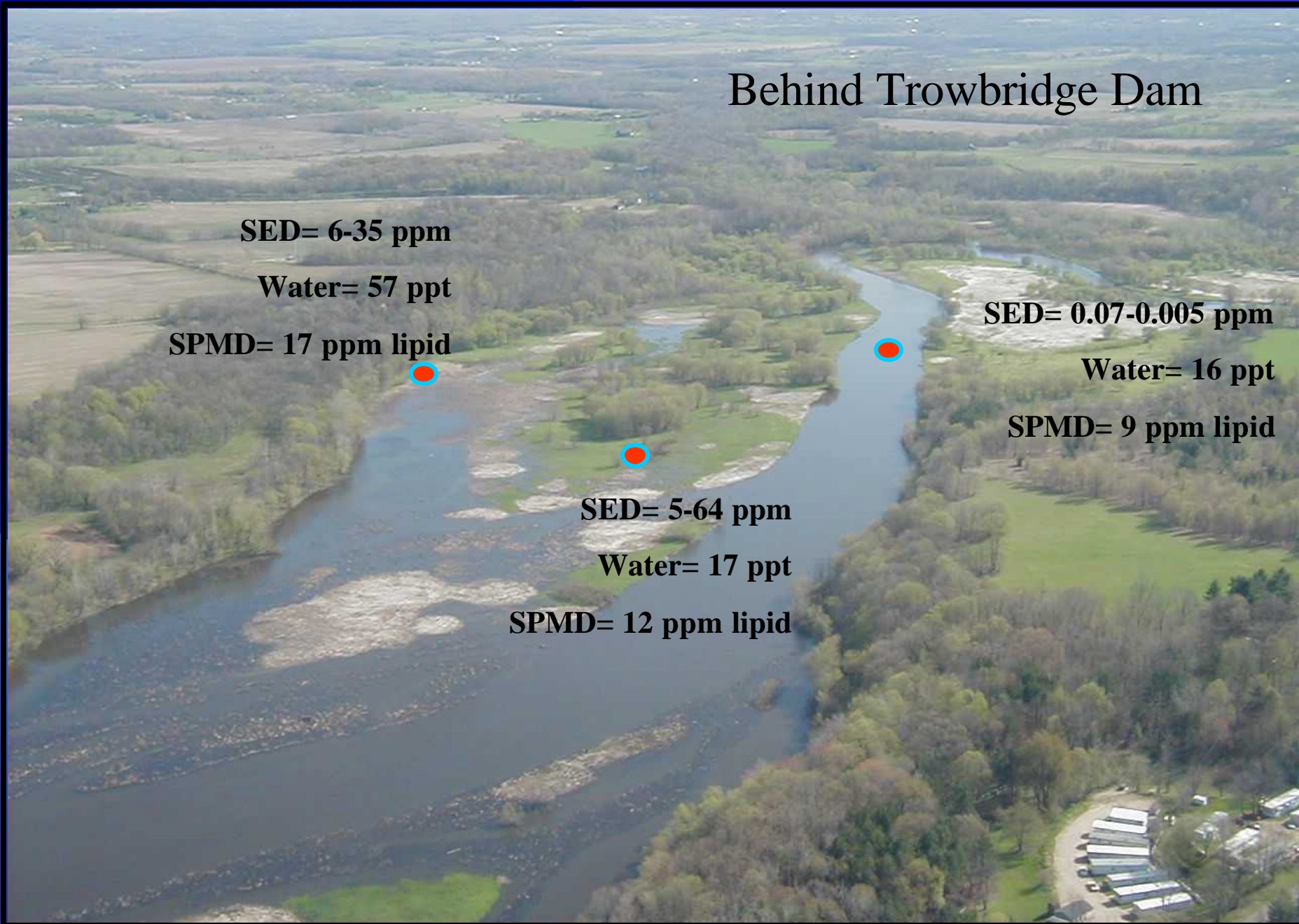
SPMD= 9 ppm lipid



SED= 5-64 ppm

Water= 17 ppt

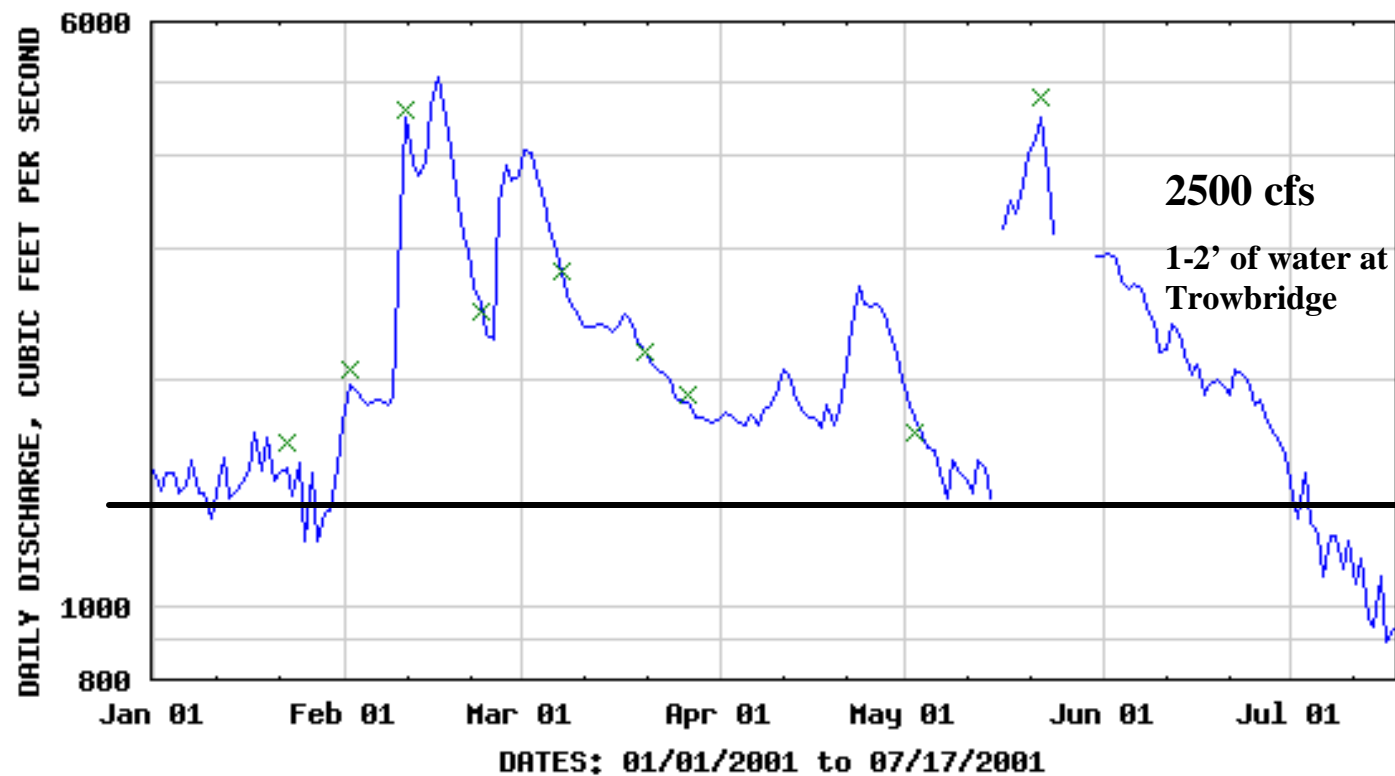
SPMD= 12 ppm lipid







USGS 04107850 KALAMAZOO RIVER NEAR ALLEGAN, MI



EXPLANATION

— DAILY MEAN DISCHARGE

× MEASURED DISCHARGE

Provisional Data Subject to Revision

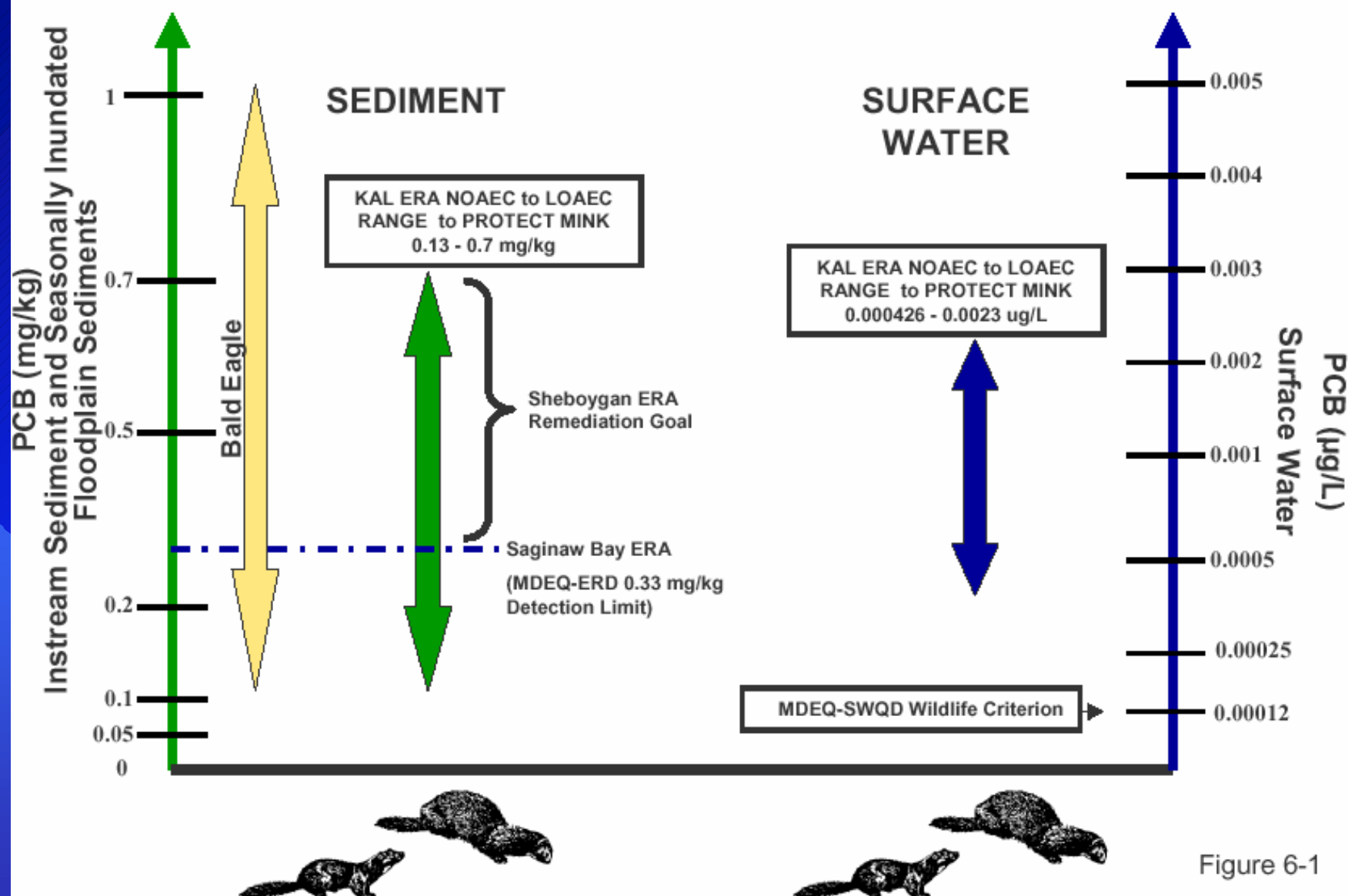
Principal 7- With Respect to the Human Health Risk Assessment

- Sufficient site specific data was collected to determine risks are unacceptable to anglers using standard USEPA guidance
- Fish tissue concentrations exceed Michigan Department of Community Health fish consumption advisory levels
- PRPs probabilistic human health risk assessment assert risks are acceptable
 - Their risk assessment incorporates uncertainty in toxicological dose response evaluations counter to EPA policy
 - Used the results from the angler survey inappropriately
 - ATSDR data showed that after adjusting for age, fish eaters had higher blood PCB levels than non-fish eater
- Range of remedial clean up levels developed for various angler scenarios
 - Central tendency angler
 - High-end Sport angler
 - Subsistence Angler

Principal 8- Ensure that Sediment Cleanup Levels are Clearly Tied to Risk Management Goals

- MDEQ has developed sufficient site-specific data to determine that the sediment clean-up levels in their risk assessments will:
 - Reduce or eliminate fish advisories
 - Promote healthy wildlife (e.g. mink) populations
 - Be protective of threatened and endangered species (e.g. bald eagle)

Protective Threshold Sediments/Surface Water PCB Concentrations for Mink Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site



Protective Threshold PCB Surface Soil Concentrations (Range for NOAEC – LOAEC) for Ecological Receptors

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site

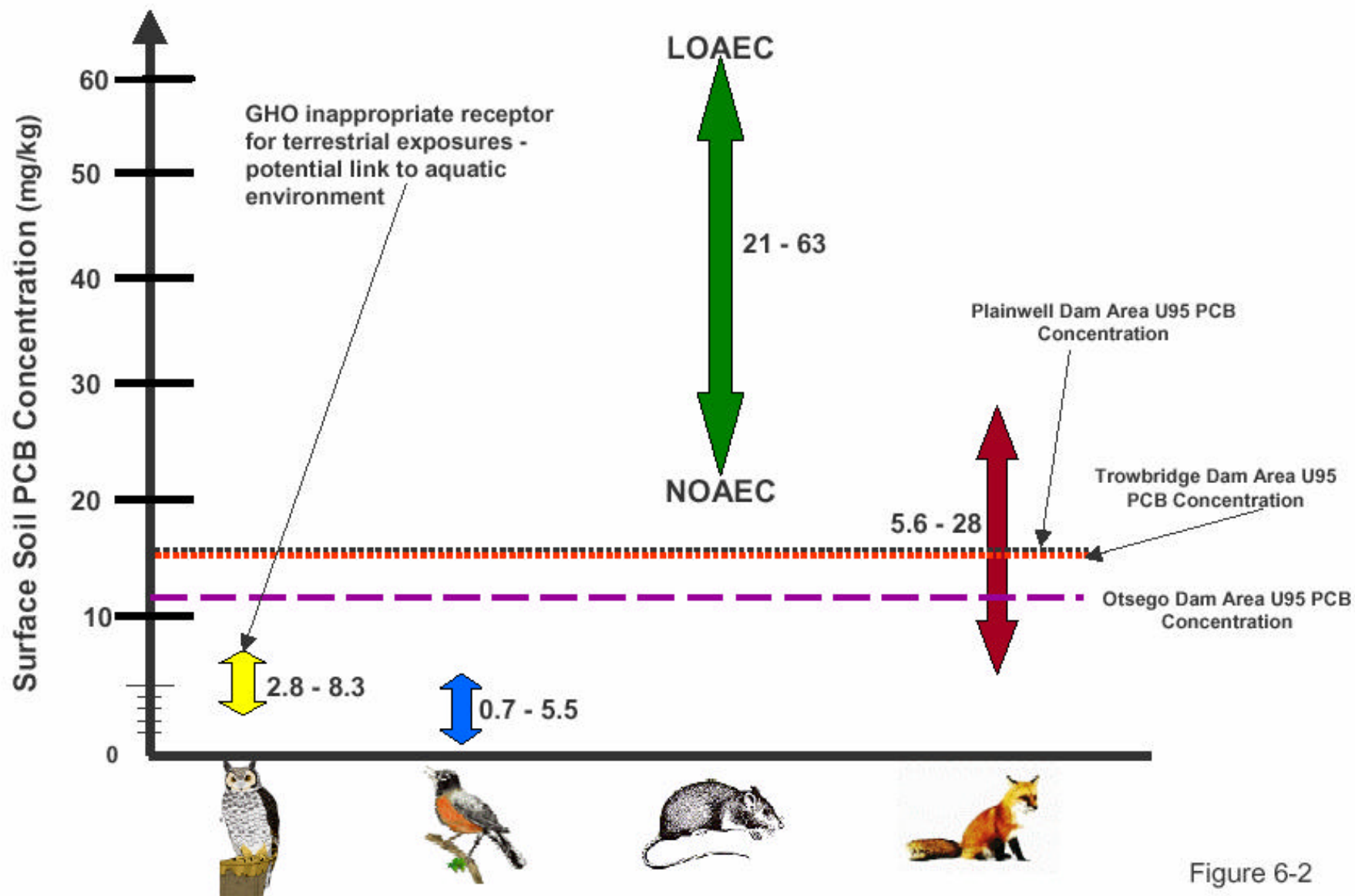


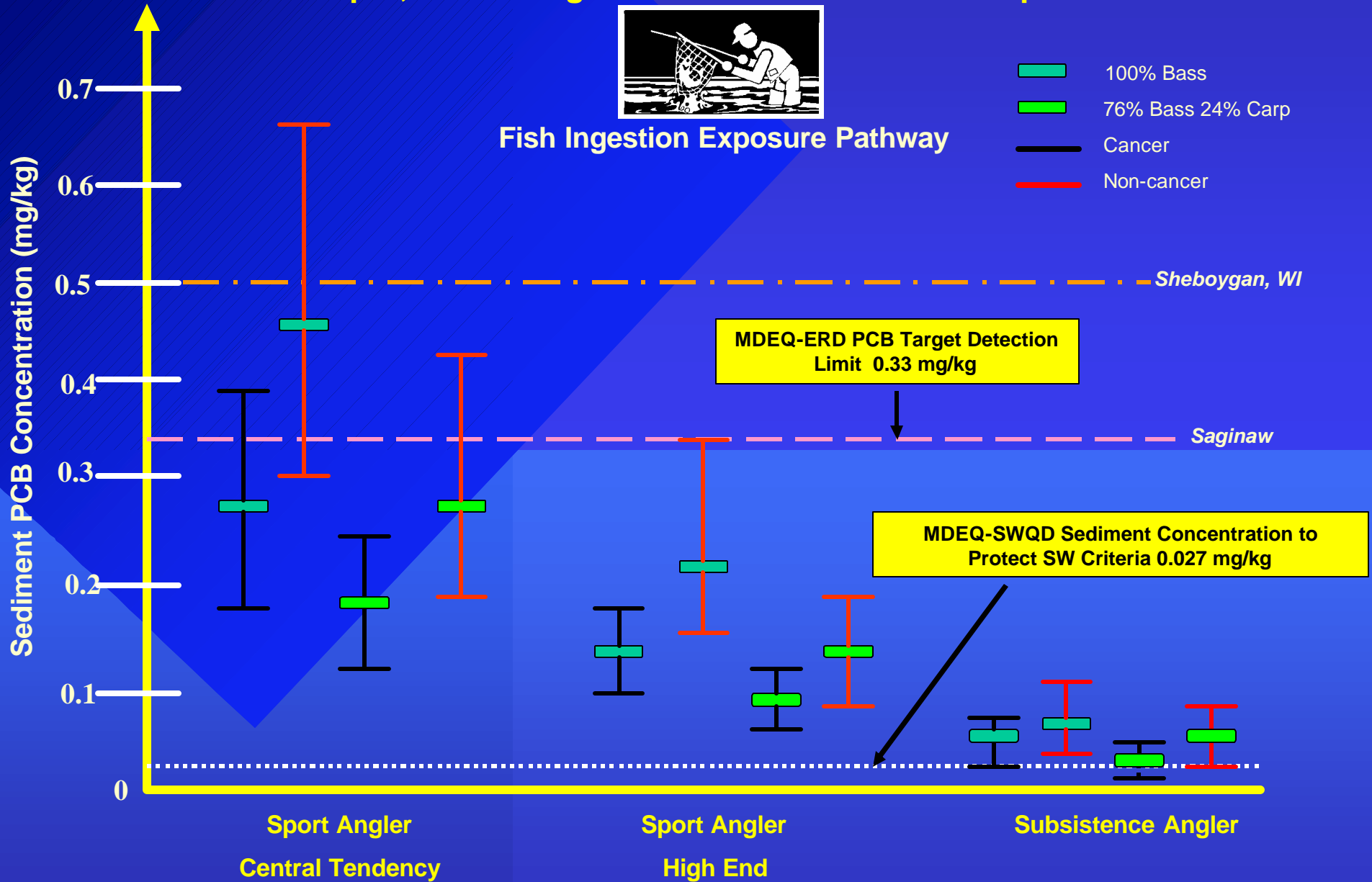
Figure 6-2

Human Health Protective Threshold PCB Concentrations in Sediments

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site



Fish Ingestion Exposure Pathway



Principal 9- Maximize the Effectiveness of Institutional Controls and Recognize their Limitations

- Effectiveness of institutional controls apply only to human receptors
- Recent events limiting the effectiveness of institutional controls on the Kalamazoo River include:
 - MDCH has discontinued its state-wide fish advisory pamphlet
 - Vandalism of public fish advisory signs occurs repeatedly
 - Advisories and warnings do not reach all populations effectively or fairly based on cultural and economic issues
 - Most of the floodplain areas are MDNR lands and deed restrictions are not compatible with MDNR goals for the river

Principal 10- Design Remedies to Minimize Short-term Risks While Achieving Long-term Protection

- Selected remedies should not restrict the long-term goals of the resource
- Dams should not be relied upon as a permanent feature
- The river should be allowed to meander where possible
- Channel stabilization with rip-rap and tires is against natural resource management principals
- Catastrophic/extreme events are not easy to predict
- PRPs fate and transport model can not predict long-term trends after concentration trends have flattened
- Short-term risks from removal actions such as dredging can be controlled, case example – Bryant Mill Pond Removal Action

Bryant Mill Pond/Portage Creek Interim Remedial Action



March 1999



August 1999



Average PCB Concentrations in Carp
Before Remediation

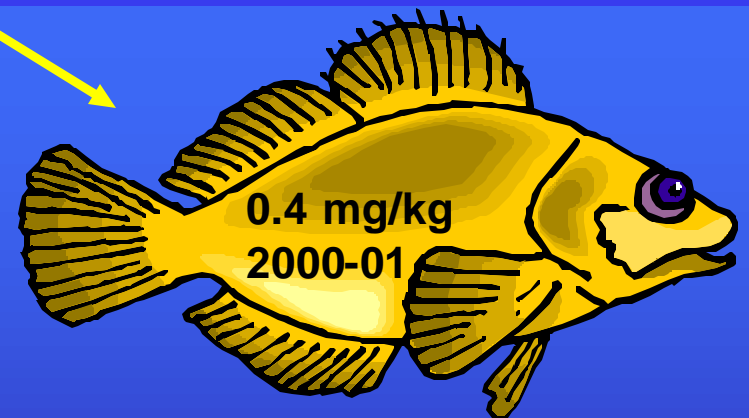
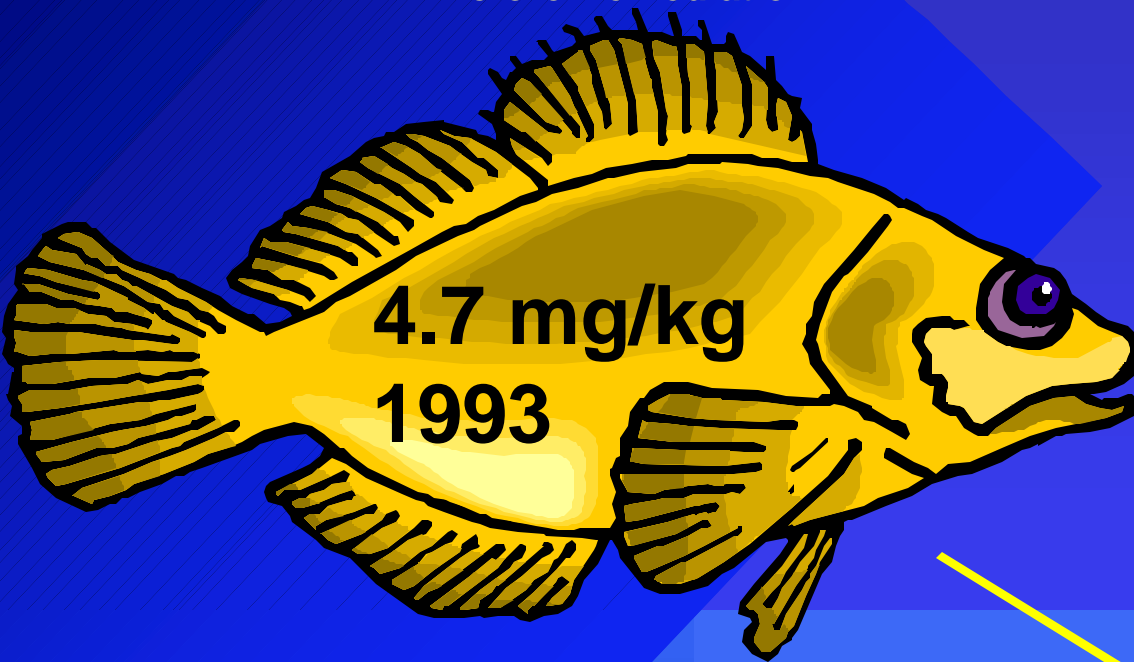
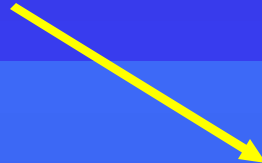
4.7 mg/kg
1993

Average PCB Concentrations in Carp
After Remediation

0.4 mg/kg
2000-01

OU-1

Portage Creek



The Kalamazoo River and associated tributaries are a valuable resource to the local citizens and the people of Michigan!



“We need good science more than ever so we can use and sustain natural resources while maintaining the public trust and the integrity of our world’s ecosystem”

Christine Todd Whitman, EPA Administrator

Questions and Answers